Forest Insect & Disease Management

Aerial Survey

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AN AERIAL SURVEY OF EASTERN IOWA TO DETECT FOREST PESTS, 1979

by

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INTRODUCTION

Iowa has approximately 1.6 million acres of commercial forest land. Most of the forest lies along the major drainages (i.e. Mississippi and Missouri Rivers) where the land is often unsuitable for agriculture. Over half of Iowa's commercial forests and three State Forests are concentrated in the eastern third of the state, with the remaining forested acreage found in small farm woodlots and along river drainages within the state.

Iowa's pest management program has relied primarily on a ground surveillance program to detect major pest problems throughout the state. Although aerial photography has been used on a limited basis on selected areas of Iowa to determine oak wilt distribution, this form of aerial survey was considered too costly and too difficult to time because of weather conditions. Aerial sketchmapping offers some advantages over aerial photography; these include greater flexibility in relation to weather, nominal cost, information that is easily disseminated among land managers, and efficient coverage of large areas. Disadvantages of sketchmapping are its subjectivity (no two observers see exactly the same thing) and very conservative estimates of acreage and/or number of trees affected (U.S. For. Serv. 1970).

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This report describes the methods used and results of the aerial sketchmap survey of portions of eastern Iowa in 1979 and contains management information that can be used in planning future sketchmap surveys in this State.

OBJECTIVE

This cooperative survey had two objectives: 1) to train Iowa Conservation Commission personnel in sketchmapping; 2) to implement a general detection survey of insect and disease-related problems on forested land in the eastern third of Iowa and on Iowa's three State Forests.

METHODS

The sketchmap survey was made in mid-June when damage by tree defoliators was most obvious. Of the 1.6 million acres of Iowa's commercial forest land, approximately 885,000 acres was covered (Ostrom 1971) (Fig. 1). The survey crew consisted of a navigator and two observers.

Before the actual survey, USDA Forest Service personnel spent 2 hours instructing Iowa personnel in map orientation, flight line location and recording procedures. This was followed by 1 hour demonstration of sketchmapping techniques during a flight over the Yellow River State Forest.

A Cessna 172 was flown at an altitude of 1,000 feet above ground level at air speeds of 90 to 95 mph.

Flight lines were charted on U. S. Geological Survey topographic maps with scales of 1/24,000, 1/62,000, 1/250,000. Three map scales were used because of the limited availability of maps with the preferred scale (1/24,000). The Geological Survey is now producing maps for the state of Iowa at that scale.

On private ownerships, flight lines were at intervals of 10 to 12 miles along river and stream drainages to optimize coverage of forested areas. On Iowa's three State Forests, flight lines were reduced to 3-mile intervals to more accurately delineate forest pest problems.

Symptoms such as hardwood defoliation, conifer discoloration, and tree mortality were recorded on topographic maps; a color scheme was used to mark affected areas. Of the 103 marked locations of pest problems recorded on the flight maps, 46 were checked from the ground (Fig. 1). Plots were selected as a representative sample of the survey areas; however, accessibility was a major consideration.

RESULTS

Cost analysis and pest damage

The survey required 21 hours of flying time. This includes 6 hours of ferrying time between airports and the forested areas. At a cost of $40.00/hr for the pilot and plane, the cost amounted to $ .0095 per acre, excluding the cost of the sketchmapping crew. The majority of forest pest activity or other visible damage was in the defoliation category. A list of observed damage for hardwood and conifers follows:

Hardwoods

Defoliation--Defoliation was primarily in forested areas containing either honeylocust, Gleditsia triacanthos L., or black locust, Robinia pseudoacacia L. Defoliation of these species ranged from 30 to 90 percent. Locust defoliation occurred in 73 percent of the areas checked from the ground. The causal agents of the defoliation were identified as a locust leafroller, Agonopterix sp. prob. robiniella (Packard) (identification of this insect was made by D. M. Weisman of the Systematic Entomology Laboratory), and spring cankerworm, Paleacrita vernata (Peck) (Figs. 4-5).

The greatest concentrations of A. robiniella were found in the northern counties, primarily in 1-to 10-acre pockets. Although neither black nor honey locust are considered important commercial timber species in Iowa, they are important as shelterbelt trees. Heavy defoliation of these trees may predispose them to attack by the locust borer, Megacyllene robiniae (Forster).

Disease--Noted in the survey were oak wilt and Dutch elm disease. No attempt was made to map these because of there severity and general distribution.

Other hardwood mortality areas observed and checked in the field proved to be fire related or due to grazing practices. There were five of these areas and they each averaged less than 20 acres.

Conifers

Diseases--The most prevalent conifer disease was a needlecast on Austrian pine, Pinus nigra Arnold, caused by Dothistroma pini Hulb. (Fig. 2). It occurred in plantations throughout the survey area. Although mortality was rare, this disease can render Christmas trees unsalable and cause a reduction in tree growth. Christmas tree growers should check with the Extension Service in their area for recommended treatment in controlling this disease.

Defoliation--On the Stephens State Forest, a Scots pine Pinus sylvestris L. plantation had moderate to severe defoliation by the European pine sawfly, Neodiprion sertifer (Geoffroy). With information obtained from Iowa field personnel and subsequent ground checking, sawfly defoliation was also found in other areas of the State. This defoliation was not severe enough to be detected during the aerial phase of the survey. All defoliation areas observed were less then 2 acres at any one site.

Also on the Stephens State Forest, mortality was mapped in pockets of red pine, Pinus resinosa Ait., and jack pine, Pinus banksiana Lamb. These areas had previously been diagnosed as centers of root rot caused by Fomitopis annosa (Fries) Karsten, (formerly Fomes annosus (Fries) Cooke). No current infection symptoms were found and the only trees present had been dead for several years.

Winter desiccation of conifers was encountered on the Shimek State Forest. Fifteen acres of trees were affected; most of the species were planted out of their range. Certain hybrid pine, produced by a cross between shortleaf, Pinus echinata Mill., and loblolly, Pinus taeda L., seemed to be most affected; mortality was found throughout the plantation. Other species of pine displayed similar, but less severe, damage (Fig. 3).

DISCUSSION

Compared to conventional ground checking surveys, the sketchmapping technique is an effective detection procedure. Although all forest disorders are not detectable from the air, most major pest problems which cause change in visual appearances can be effectively and quickly delineated at a minimal cost. Conventional surveillance techniques or ground detection often do not give a total perspective of the extent of injury or damage present, and are more costly on a limited basis.

The biggest problem encountered was the limited availability of maps with desirable scale showing adequate detail. Geological Survey topographic quadrangle maps of 1/24,000 scale are recommended for sketchmapping surveys because their detail allows the observer to map areas with greater accuracy (For. Serv. 1970).

Another difficulty encountered is inherent in the forest distribution of Iowa; approximately half of the total survey area coverage involved farmland that contained little or no timber. More effective coverage may be obtained if district foresters were involved in the flight planning phase.

Since most of the forested land occurs in the eastern one-third of the state, an annual aerial survey covering Iowa's three State Forests--and perhaps a portion of the Missouri River Valley--would give a representative sample of the State's pest problems. A limited survey such as this would reduce the expenses incurred during annual insect and disease surveys and aerial sketchmapping could be completed in approximately 2 days. If this sample should disclose a significant pest problem, a larger survey could be undertaken to determine the extent and intensity of the damage. Due to the brief time frame needed to complete the survey, annual surveys could be conducted in both the spring and summer to detect pest problems occurring at different times of the year.

The state forestry system lends itself well to setting up the sketchmapping procedure on a recurring basis. Ideally, a permanent employee should be trained in planning and executing the sketchmapping survey. The individual should have a good working knowledge of pest management and would be responsible for determining the optimum timing of the survey and catergorizing damage as seen from the air. The pest manager would also be the team leader in conducting the periodic surveys.

On surveys of the state forest, individuals familiar with the area could be used as part of the survey team. For instance, the area forester on a particular forest and possibly the forester from the district being surveyed could be included as crew members with the pest manager. Thus, no additional personnel (i.g. summer employees or temporary assistance) would be needed to complete the survey. The permanent field personnel would obtain experience with the sketchmapping detection technique and become familiar with forest pest problems in their area. The only additional expense for the project would be the cost of the aircraft, pilot, and maps.

The development of a base map of the three State Forests should be considered. A map similar to those used by National Forests on a scale of 1/2 inch to the mile would constitute an ideal format for locating possible pest problem areas. We believe the aerial sketchmapping technique would provide land managers with a viable method of protection and management of Iowa's forested areas.

CONCLUSION

The damage detected in the aerial survey was predominately in those areas where trees exhibited early spring defoliation or chronic disease symptoms. Although none of the problems observed causes severe damage to the commercial timber resource, they illustrate the potential applicability of the sketchmapping technique. This year's aerial survey was primarily a training exercise that demonstrated the sketchmapping procedure and its value as a detection tool. Refinements of this year's survey can be applied in subsequent years to further enhance the practicability and utility of this technique in Iowa.

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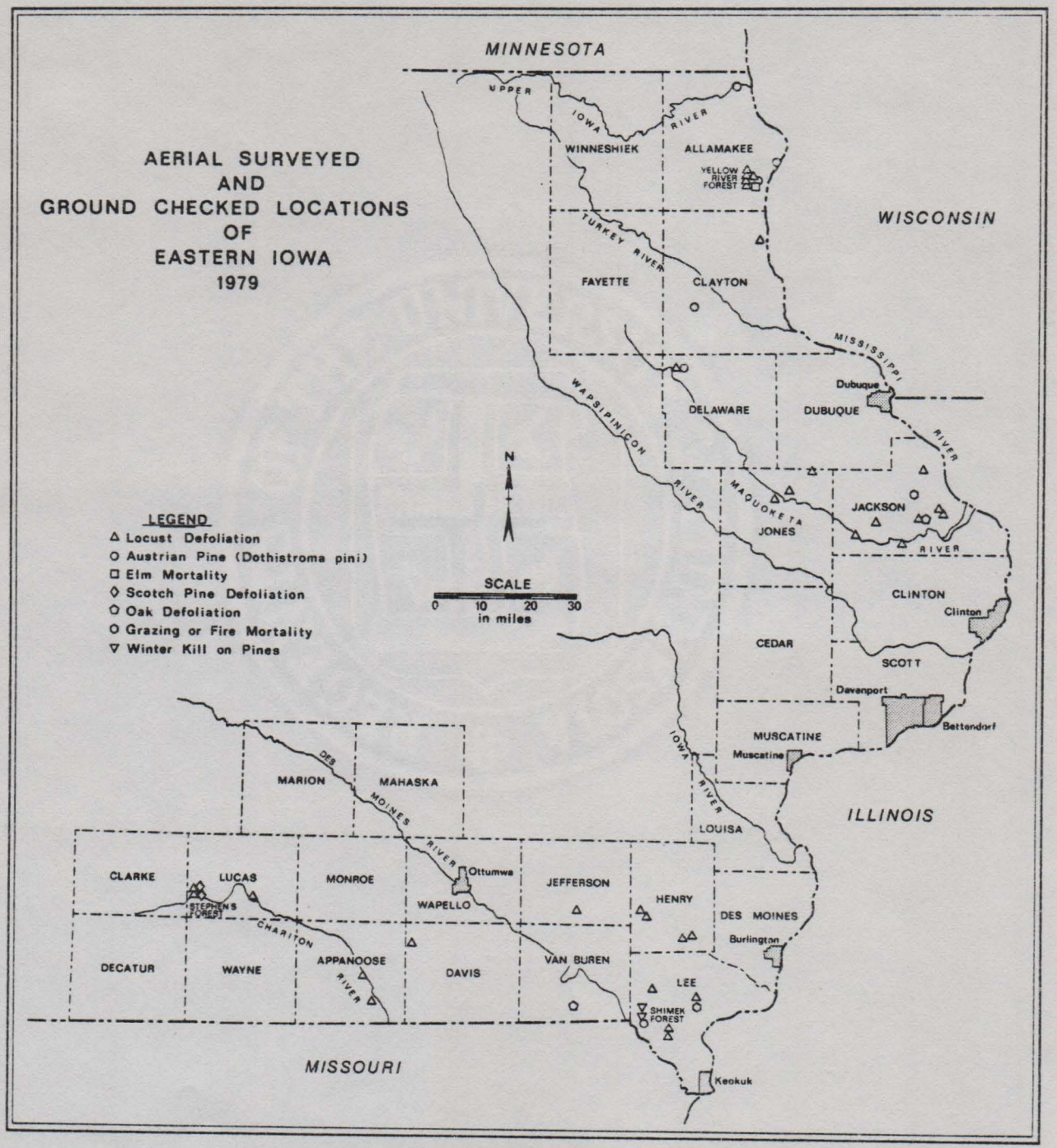
AERIAL SURVEYED
AND
GROUND CHECKED LOCATIONS
OF
EASTERN IOWA
1979
MINNESOTA
WISCONSIN
ILLINOIS
MISSOURI
UPPER IOWA RIVER
WINNESHIEK
ALLAMAKEE
YELLOW RIVER FOREST
TURKEY RIVER
FAYETTE
CLAYTON
MISSISSIPPI RIVER
Dubuque
DELAWARE
DUBUQUE
WAPSIPINICON RIVER
MAQUOKETA RIVER
JONES
JACKSON
CLINTON
Clinton
CEDAR
SCOTT
Davenport
Bettendorf
MUSCATINE
Muscatine
IOWA RIVER
LOUISA
DES MOINES RIVER
MARION
MAHASKA
Ottumwa
WAPELLO
JEFFERSON
HENRY
DES MOINES
Burlington
CLARKE
LUCAS
STEPHENS FOREST
MONROE
CHARITON RIVER
DECATUR
WAYNE
APPANOOSE RIVER
DAVIS
VAN BUREN
LEE
SHIMEK FOREST
Keokuk
N
SCALE
0 10 20 30
in miles
LEGEND
△ Locust Defoliation
○ Austrian Pine (Dothistroma pini)
□ Elm Mortality
◇ Scotch Pine Defoliation
⬠ Oak Defoliation
○ Grazing or Fire Mortality
▽ Winter Kill on Pines

Figure 2.

Dothistroma pini damage on Austrian pine.

Figure 3.

Winter injury on loblolly shortleaf pine.

Figure 4.

A locust leaf roller, Agonopterix sp. larva on honeylocust foliage.

Figure 5.

Defoliation of the locust leaf roller and spring cankerworm (center), elm mortality (upper right).

Figure 6.

Spring cankerworm, Paleacrita vernata larva on honeylocust foliage.